Halsted (Wm S.)

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Shuh said, "If no other field were offered to the surgeon for his activity than herniotomy, it would be worth while to become a surgeon and to devote an entire life to this service." Quite as well, certainly, might this be said of operations for the radical cure of hernia. There is, perhaps, no operation which has had so much of vital interest to both physician and surgeon as herniotomy, and there is no operation which, by the profession at large, would be more appreciated than a perfectly safe and sure cure for rupture.

Just now, most of the so-called radical-cure operations are under a cloud. They have not withstood the test of time. Modern text-books of surgery refer to operations for the radical cure of hernia with more or less misgiving. The newest American surgery[2] disapproves of operations for the radical cure of reducible hernia if a truss can be worn, and believes that Czerny's method is as good as any, should an operation be necessary.

The most telling blows against radical-cure operations in this country have been dealt, perhaps, by Bull. His papers on the radical cure of hernia and on relapses after the various operations for the radical cure of hernia have produced a profound impression on both practitioners of medicine and practitioners of surgery. Bull concludes the first of these papers[3] as follows: "These observations will, without doubt, be duplicated in the cases yet to be traced, and go to strengthen the

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[1] Read at the Annual Meeting of the Medico-Chirurgical Faculty of Maryland, at Easton, Md., Nov. 17th, 1892.

[2] An American Text-book of Surgery. Keen and White.

[3] Bull: On the radical cure of hernia, with results of one hundred and thirty-four operations: Medical News, 1890.

conviction that all methods of radical cure will be found unsatisfactory." In his second paper[1] he writes: "I hold, after the knowledge of these failures and in view of the well-established fact that after the old operations for hernia recurrence has been often long delayed, that it is wise to drop the term *cure* and to estimate the value of given procedures by the relative proportion of relapses."

From 1883 to 1885, Bull operated for the cure of hernia chiefly by what he calls Socin's method—ligature and excision of the sac. From 1885 to 1889 he employed what he calls Banks' method—ligature and excision of the sac, with suture of the pillars of the external ring. Since 1889 he has practised the sewing-up of the canal after ligating and excising the sac.

Of the cases operated upon by the first method, at least 27.27 per cent. relapsed within one year; of those operated upon by the second method, at least 40 per cent. relapsed within one year; and of those operated upon by the third method, at least 42 per cent. relapsed within one year.

"My own results," writes Bull, "as to relapse being no better by the complicated method of suture of the ring alone, or of the ring and canal, than by the simpler method of excision of the sac after ligature, I shall confine myself to that method of operation till other procedures which have stood the test of years make a more promising showing." Bull's results became less promising the longer he observed his cases. From a series of one hundred and thirty-six cases there remained only four which had been over four years without recurrence. In his second paper Bull says: "Now that ten years have elapsed since the modern radical operations have been in vogue, we ought to hear of, or have presented to us, patients who have been more than five years, at the least, without relapse. We could naturally expect to see such cases occasionally at a special hospital. But there are none such." Notwithstanding these facts, Bull does not advise that operations for the relief of hernia be discontinued, nor does he wish to discontinue efforts to discover more satisfactory methods for its cure. For, of the cases operated upon, almost all were relieved for a time, and some for several years; and of the

[1] Bull: Notes on cases of hernia which have relapsed after various operations for radical cure.

cases which had relapsed, the majority were more comfortable than they had been before they were operated upon.

These are admirable papers and faithfully depict what is to be expected if a hernia is operated upon by the methods which Bull has employed. To-day, therefore, the majority of surgeons operate for the radical cure of hernia only when the hernia is strangulated or cannot be retained with a truss. A few believe that they have had results good enough to justify their operations upon almost every case which presents itself.

Until the sixteenth century incarcerated hernia was treated only by taxis. If taxis failed, the patient died. An ordinary rupture and stone cutter, Pierre Franco, was the first to relieve incarceration by herniotomy. As pre-eminent among his fellows as Paré was among surgeons, he is one of the most illustrious figures in surgical history. He has described, and probably was the first to conceive both the intraperitoneal and extraperitoneal methods of herniotomy. The following is an extract from his chapter on herniotomy:[1] "When all other means have failed we proceed to operate. One must have a little staff of the thickness of a goose-quill, or somewhat thicker, and round, on one side flat and half round and it must be rounded off at the front end that one may press forward easier. One makes accordingly an incision at the upper part of the scrotum, drawing towards the pubes, and at the outset makes the opening only just large enough to admit the staff, for one must take care that he does not thrust into the intestines. When one has found the hernial sac, one must insinuate the little staff between it and the groin and then push upwards. The flat side of the staff must be up. It would not succeed if the staff were entirely round for the knife would then glide from side to side. When one has pushed the staff far enough, he cuts upon the flat side of it through the flesh of the scrotum and groin so as not to injure the intestines now that he has made a larger opening; there is no danger in making the opening large enough to enable one to replace the intestines the more easily because the sac and the flesh of the belly can then be the more readily stretched, and hence perhaps the intestines be returned the more nearly into their correct position. One must reintroduce them little by little. Should the case occur that they will not go back

[1] Lehrbuch der Chirurgie, Bd. iii. Eduard Albert.

easily and without great pressure because of too great an accumulation of their contents or on account of inflammation, then one must proceed as follows: one takes the hernial sac and cuts it very delicately upon the nail while one raises the sac with hooks and cuts it through to the intestines; and when one has made an opening large enough to admit the staff one pushes it very gently upwards between the sac and the intestines; at the same time one must push the parts aside so as to see if he is catching the intestines. The intestines, however, are not easily caught because they are homogeneous and smooth. One must accordingly divide the sac upon the staff up to the peritoneum, that is, up to the highest point, namely, to the hole where the intestines begin to descend to the scrotum; but one must make a generous opening into the peritoneum without fear and for the sake of greater safety, just as one does in desperate cases of the kind. One then takes a little piece of fine linen and pushes the intestines gradually back, beginning with those which are higher up towards the peritoneum and which lie nearer to the belly."

The suggestion of Franco to replace the intestines with linen is an excellent one, and for me one of the proofs of his genius. There are to-day many surgeons who have not discovered this device and who labor with the fingers to introduce the slippery intestines. With a piece of gauze one can replace the intestines rapidly and with precision, whereas the manipulation of the intestines with the fingers is often a ludicrous performance. Paré, about the middle of the sixteenth century, gives precise instructions for performing herniotomy. He was probably the first surgeon to prescribe herniotomy for all cases of incarcerated hernia. But it was not until the end of the seventeenth century or beginning of the eighteenth century that the operation, through the efforts of Wiseman, Petit, and Richter, became generally recognized and practised.

From a clinical, anatomical and pathological standpoint the work of Sir Astley Cooper on hernia is undoubtedly the greatest of all, and very little has been added to our knowledge of hernia of all kinds since his book appeared. From his chapter on the operation for inguinal hernia one gets a good idea of the respect which surgeons at the beginning of this century had for arteries. Speaking, for example, of the division of the little external pubic artery, which always crosses the sac near the external abdominal ring, he says:

"This circumstance, however, is in no degree alarming to a surgeon who expects it, as the bleeding may be stopped by the vessel being compressed by an assistant, or if the artery is larger than usual, owing to the scrotum being long distended by the disease, the blood may be stopped by a ligature."

Cooper substituted his world-famed herniotome for the bulb-pointed knife, and abolished the use of the hollow director which the disciples of Franco and Paré believed to be indispensable.

Otherwise the technique of herniotomy is to-day precisely that of Franco, the gifted stone and rupture cutter of the sixteenth century, except that in pre-aseptic times he, perhaps wisely, preferred the extraperitoneal[1] to the intraperitoneal method. The actual war which these two methods stirred up among surgeons for more than a century is interesting. On the side of Petit, who after Franco was the great disseminator and defender of the method, we find arrayed from the English, Cooper, Key, Teale, Paget, Liston, Gay, Lawrence, and others; from the Germans, Roser, Shuh, Dummericher, Busch, Baum, and others; from the French, Gosselieu, Chauvet, Le Dentu, and others.

The same objections and the same refutations appear year after year. The inconsistency of those opposed to the extraperitoneal method is remarkable. They were, for example, all of them advocates of the taxis, and would not resort to the cutting operation until the taxis had failed; but objected to the extraperitoneal herniotomy because of the danger of returning unseen the contents of the sac. Richter is the only one to whom it occurred pointedly to inquire why that should be feared at the time of the operation which had not been feared a quarter of an hour earlier when taxis was being performed.

Dieffenbach, the most conspicuous advocate of the intraperitoneal method for inguinal and femoral hernias, permits the extraperitoneal method for umbilical and ventral hernias, because "it lessens the danger of peritonitis."

From Celsus we have reports of operations for the cure of reducible hernias. At that time it was believed that many

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[1] Kocher, by the way, has recently devised an extraperitoneal operation for the radical cure of hernia.—(Correspondenzblatt für Schweizer Aerzte, 1892.)

hernias were accompanied by a rent in the peritoneum. The incision was made down to the hernial contents, and the supposed rent in the abdominal wall was closed by sutures.

Heliodorus gives a most masterly description of an operation for the radical cure of hernia which would be a creditable performance to-day. The directions which he gives for cutting off the sac are unique, and as follows:[1] "We must cut off the hernial sac with great care, for if we take away less than is protruded, the result will be the production of a new hernia, for the edges of the wound will be slack and the way prepared for the slipping out again of the intestines. If one resects more than is protruded by drawing out additional peritoneum from its legitimate resting-place, then the hernia will recur, for the edges of the peritoneum, because of the too great resection, cannot be brought together, and the patient is in danger because normal parts have been taken away. In order, therefore, that we may not miss excising an amount which is precisely correct it is necessary to draw the sac outwards by catching the tip of the same; so soon as the edges of the abdominal wound begin to be everted, enough of the peritoneum has been drawn out and so much is to be excised. If the edges of the abdominal wound have been strongly everted, then one must assume that more peritoneum has been drawn out than is necessary and should pull with less force. When just enough peritoneum has been drawn out the sac is to be twisted. Having been cut off along a straight line, the peritoneum becomes folded upon itself and screwed up and closed so tight that not even the point of a probe can be introduced."

That Heliodorus recognized the existence of the infundibuliform fascia there can be no doubt,[2] for he says that one has not reached the true hernial sac until the last of the layers which enclose together the hernial tumor and the spermatic cord has been divided. With the exception of the torsion of the sac, which we replace with the suture, the operation for the radical cure of hernia in the time of the Roman emperors was quite on a par with the operation as it is usually performed in our day. Four hundred years later the operation had ceased to exist.

I am not inclined to attach much importance to the manner

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[1] Lehrbuch der Chirurgie, Bd. iii. Eduard Albert.

[2] Albert, l. c.

of closing the sac, nor to the level at which it is cut off, nor to the treatment of the sac in general, provided the peritoneum is not allowed to protrude outwards into the wound. With the revival of the operation for the radical cure the testicle was sacrificed. Paul of Aegina directs that the sac be ligated at two places, and that, cutting between the ligatures, the testicle and sac be removed. The Arabians did not advance beyond this method. At length when it occurred to Lanfrancous to attempt to cure hernia without sacrificing the testicle, he believed that the inspiration was from God. In 1882 and 1883 Kraske advised castration in certain difficult cases for the cure of hernia.

Guido von Cauliaco, although not sacrificing the testicle himself, was inclined to excuse others for doing so, because the hernia was less likely to return after the testicle had been removed, and the generating power was not lost. This observation of Guido von Cauliaco is interesting because it implies that in the Middle Ages the cord must have been regarded as the important factor in the production of hernia. From that time to the introduction of antiseptic surgery, methods of all sorts, many of them cruel and some barbarous, have been in vogue. They may be classified as follows:

1. Pressure with or without the simultaneous application of irritating and so-called contracting remedies.
2. Caustics and the actual cautery.
3. Ligature of the sac, with or without cutting it off.
4. Introduction of foreign bodies into the hernial sac.
5. Healing in of a detached portion of skin, or of a portion of impacted skin into the abdominal ring.
6. The injection of irritating fluids within or outside of the hernial sac.
7. The subcutaneous suture.

Some of these methods are interesting as curiosities, and others because they are still practised.

The employment of the actual cautery for the cure of hernia appealed particularly to the knife-dreading Arabian school.[1] After the rupture had been returned and the cord drawn aside, the cautery was applied over the external abdominal ring and kept there until it had burnt through the skin and hernial sac down to the bone. The region of the external abdominal ring

[1] Albert, l. c.

having been described by Paul of Aegina as triangular, three different cautery points were sometimes used for this operation—a straight one for the center point, a gamma-shaped one for the sides, and a lens-shaped one for the surface of the triangle. The celebrated filium aureum or punctum aureum, the golden ligature or the golden puncture, was introduced by Geraldus in Metz. The sac was laid bare and then occluded by a golden thread so passed as not to include the spermatic cord.

Wood's subcutaneous suture is still practised in Great Britain, and, according to Bassini, has for years been the favorite method in Italy. I can remember when in New York the honors were about equally divided between Wood's method and Heaton's injection method. So late as 1882, J. H. Warren, of Boston, wrote a book in behalf of his injection method, which is essentially the same as Heaton's. The injection of alcohol (Schwalbe) is quite popular in Germany and France.

With the introduction of antiseptic surgery, or rather several years after Lister's first contributions to this subject, Annandale, Steele, Riesel, Nussbaum, and a few others, made bolder attempts to cure ruptures. Although differing from each other in detail, the methods of these surgeons were essentially alike and are embraced under the following heading: Ligature of the exposed neck of the sac, with extirpation or incision of the sac.

WE ARE INDEBTED TO ANTISEPTIC SURGERY FOR REINTRODUCING TO US THE OPERATION OF HELIODORUS.

In 1878, Czerny, in his valuable Beiträge zur Chirurgie, records seven cases in which after ligating the neck of the sac and excising the sac he had sutured the pillars of the external abdominal ring. He attributes to Richter the conception of the operation, saying that it was believed by Richter that for the radical cure of hernia not only must the hernial sac be destroyed but also must the ring be narrowed. He courteously concedes also to Billroth, to whom his Beiträge are dedicated, credit for the idea because Billroth had said, "If we could artificially produce tissues of the density and toughness of fascia and tendon, the secret of the radical cure of hernia would be discovered." Some years later, Banks published what he supposed to be a new operation for the radical cure of hernia. Although practically the same as Czerny's, it was for several years known as Banks' operation in this country and in Great Britain.

I am surprised to see that Lauenstein, so recently as 1890, accredits Banks with Czerny's operation. Lauenstein's ideas of Czerny's operation were perhaps obtained from the latter's first publication, and not from his Beiträge zur Chirurgie; for in his Beiträge zur Chirurgie Czerny regrets that he did not remove the sac in his earlier operations. That Banks uses silver wire instead of silk or catgut in sewing together the pillars of the external abdominal ring, and that he possibly cuts off the sac at a higher level than Czerny does, hardly entitles him to the operation. The use in general of powerful sewing materials in surgery is, it seems to me, based on a misapprehension in pathology. If, for example, the tension is so great that wire must be used to bring parts together, one must not expect permanent assistance from the wire; for the tissues will eventually be cut through by the stitches to the extent necessary to relieve the tension.

Czerny had not observed his cases long enough to undeceive him as to the value of his operation, and he expresses himself very cautiously as to its ultimate results. He sets an excellent example for less conscientious surgeons when, agreeing with Schede, he does not propose to operate upon controllable ruptures until the experience of many years with ruptures which cannot be controlled by a truss shall have convinced him of the safety and reliability of his method.

In 1879, Tilanus of Amsterdam collected for the International Medical Congress data from one hundred and twenty-two cases which had been operated upon by what were supposed to be antiseptic methods. Of the ultimate results not enough had been ascertained to enable one to form conclusions. The mortality was 6 per cent, or too great to justify operating upon ruptures which could be comfortably retained by a truss.

The most important contributions since Czerny's to the radical cure of hernia are from McEwen, McBurney, Bassini, Kocher, and Lucas-Championnière. In his own hands, McEwen's operation seems to have been perfect. It is difficult to say upon just what part of the operation its success depends. I am not inclined to ascribe it to the tampon, although Lauenstein testifies that he was fortunate enough to see the anatomical preparation from a patient cured by McEwen's method who for years subsequent to the operation had done heavy work without a truss. The patient died of an aortic aneurism. His inguinal canal was firmly closed, and on the abdominal

side of the same and firmly adherent was the sac folded up into a dense cushion, which strengthened the abdominal wall in this situation. Unlikely as this may seem, we must unhesitatingly accept the testimony of such men as Lauenstein and McEwen. Bassini, on the other hand, had an opportunity to observe at an autopsy ninety-five days after the operation, that the tampon which he had made somewhat after the manner of McEwen's had been completely absorbed; not a trace of it remained. One is so familiar with the fate of redundant tissues that it is hard to convince oneself that the tampon remains for years just as it was at the operation, and that even if not entirely absorbed it is not at least greatly reduced in size. The tampon being in place, the first step of McEwen's operation is concluded. The second step is to restore the valve-like form of the inguinal canal. This is done by one or more mattress sutures which unite the conjoined tendon to the aponeurosis of the oblique muscle. The application of these sutures is simple, although from the description it would seem to be complicated.

How much McEwen's wonderfully good results might be attributed to the wearing of trusses would depend upon the percentage of truss-wearers. It is strange that so little success has attended the practice of McEwen's operation in this country. Is the fault with the operator or with McEwen's description of the operation? Whatever the future of this operation may be, McEwen certainly took an advance-step in the treatment of inguinal hernia.

McBurney's operation is undoubtedly so well known to all Americans that a description of it would be superfluous. It would seem to be the most heroic test which is possible of scar-tissue and open-wound treatment. But scar tissue, however thick and dense, is not the tissue best calculated to recover from the effects of blows, or to permanently withstand the constant pressure of the abdominal contents. McBurney has kindly informed me by letter that although the hernia has recurred in some of his cases, the percentage of recurrence is so small that he still practises his method. Bull tabulates several relapses after McBurney's operation. More than three years ago I described a new operation for the cure of inguinal hernia in the male.[1] Six or eight months later, Bas-

[1] Bulletin of the Johns Hopkins Hospital, Vol. I, No. 1; Johns Hopkins Hospital Reports, Vol. II, surgical fasciculus, No. I.

sini of Padua published his operation for the cure of inguinal hernia which he had performed two hundred and fifty-one times, with only seven returns and no deaths except one, and that from pneumonia after the wound had healed. Bassini's operation and mine are so nearly identical that I might quote his results in support of my operation.

Instead of trying to repair the old canal and the internal abdominal ring, as McEwen had tried to do, I make a new canal and a new ring. The new ring should fit the cord as snugly as possible, and the cord should be as small as possible. The skin incision extends from a point about 5 cm. above and external to the internal abdominal ring to the spine of the pubes. The subcutaneous tissues are divided so as to expose clearly the aponeurosis of the external oblique muscle and the external abdominal ring. The aponeurosis of the external oblique muscle, the internal oblique and transversalis muscles and the transversalis fascia are cut through from the external abdominal ring to a point about 2 cm. above and external to the internal abdominal ring. The vas deferens and the blood-vessels of the cord are isolated. All but one or two of the veins of the cord are excised. The sac is carefully isolated and opened and its contents replaced. A piece of gauze is usually employed to replace and retain the intestines. With the division of the abdominal muscles and the transversalis fascia the so-called neck of the sac vanishes. There is no longer a constriction of the sac. The communication between the sac and the abdominal cavity is sometimes large enough to admit one's hand. The sac having been completely isolated and its contents replaced, the peritoneal cavity is closed by a few fine silk mattress sutures, sometimes by a continuous suture. The sac is cut away close to the sutures. The cord in its reduced form is raised on a hook out of the wound to facilitate the introduction of the six or eight deep mattress sutures, which pass through the aponeurosis of the external oblique and through the internal oblique and transversalis muscles and transversalis fascia on the one side, and through the transversalis fascia and Poupart's ligament and fibers of the aponeurosis of the external oblique muscle on the other.

The two outermost of these deep mattress sutures pass through muscular tissues and the same tissues on both sides of the wound. They are the most important stitches, for the transplanted cord passes out between them. If placed too close

together, the circulation of the cord might be imperiled, and if too far apart, the hernia might recur. They should, however, be near enough to each other to grip the cord. The precise point out to which the cord is transplanted depends upon the condition of the muscles at the internal abdominal ring. If in this situation they are thick and firm, and present broad raw surfaces, the cord may be brought out here. But if the muscles are attenuated at this point, and present thin cut edges, the cord is transplanted farther out. The skin wound is brought together by buried skin sutures of very fine silk.[1] The transplanted cord lies on the aponeurosis of the external oblique muscle and is covered by skin only. In both of the patients presented you will feel the cord in this situation distinctly. They were operated upon two and three and one-half years ago.

Bassini believes that he restores the inguinal canal to its physiological condition, inasmuch as he makes "a canal with two openings, an abdominal and a subcutaneous; furthermore with two walls, a posterior and an anterior, through the middle of which the spermatic cord passes obliquely." But the original canal is not by any means an affair so simple as Bassini's. To reproduce the equivalent, anatomically and physiologically, of the inguinal canal is impossible. Bassini's operation, although essentially the same as my operation, is different in some respects. 1. Bassini always brings the cord through the muscles at the internal abdominal ring. The point out to which I transplant the cord is determined, as I have said, by the condition of the muscles. 2. Bassini does not excise the superfluous veins. I believe that it is advisable to reduce the size of the cord as much as is practicable. 3. In Bassini's operation the cord lies posterior to the aponeurosis of the external oblique muscle; in mine, between this aponeurosis and the skin. To secure for the cord the position which Bassini recommends an additional row of stitches is required. Unless it should be demonstrated by a comparison of the results of the two methods that there is something to be gained by these additional stitches, it would be well for the sake of the wound and the operator to discard them.

[1] Instead of the interrupted buried skin suture as shown in Plate III, we now use an uninterrupted buried skin suture without knots, which is withdrawn after two or three weeks.

Kocher thinks that the methods of Bassini and himself are to be preferred to other methods, McEwen's for example, because they (the former) enable the patient to get out of bed on the eighth day. I fail to see anything in the methods of Kocher and Bassini and myself which might enable the patient to get out of bed earlier than if he had been operated upon by the method of McEwen. The time to be spent in bed depends upon the judgment of the surgeon and not, open methods excluded, upon the particular method. Our patients are kept upon their backs for 21 days. Wounds thoroughly healed throughout per primam are not strong in eight days. One can easily tear open a typically healed wound which is not more than six or seven days old. Not long ago in attempting to restore a club foot to its proper position I accidentally and with very little force pressed wide open a wound which had healed in the typical way and was eight days old.

A wound is certainly stronger on the fourteenth day than it is on the seventh, and stronger on the twenty-first day than on the fourteenth. Just how long wounds of skin and muscle which have healed by first intention may continue to increase in strength we do not know. In our hernia wounds, the subcutaneous ridge of aponeurosis and muscle which results when the parts have been brought together properly by buried mattress stitches does not disappear entirely for five or six or more weeks. I sometimes question the propriety of allowing, as I do, my patients to walk about on the twenty-first day.

The technique of operations for the radical cure of hernia should be unusually perfect, because we have to violate occasionally what I consider to be one of the most important principles of antiseptic surgery. We have to constrict the tissues somewhat with our deep sutures. It is not always possible to bring together the pillars of the external abdominal ring without a little tension. One can of course make relaxation cuts, but these would be quite as undesirable as a moderate amount of tension. Our hernia wounds illustrate admirably the danger of constricting tissues. We never resort to drainage of any kind for fresh wounds. And with the exception now and then of a hernia wound, none[1] of our fresh wounds sup-

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[1] Not more than one or two in a year. *Vid.* Johns Hopkins Hospital Reports, Vol. 2, surgical fasciculus, No. 1.

purate. Inasmuch as we rarely if ever have occasion to constrict tissues in other fresh wounds, it is almost certain that the occasional stitch abscess in a hernia wound is due to tissue constriction plus, of course, the infection. To provide for a good circulation in every particle of tissue in and immediately about a wound is as much a part of our technique as are the ordinary antiseptic precautions. The better the circulation the less the likelihood of suppuration.[1]

Since the opening of the Johns Hopkins Hospital, 3½ years ago, 82 operations for the radical cure of hernia have been performed, and without a death. 64 of the cases were males, 18 were females. Of the females, four had femoral, 13 inguinal and one umbilical hernia. Of the males, 63 had inguinal and one femoral hernia. Five of the males were operated upon by Dr. Brockway by McBurney's method. Of these five cases two have recurred; two have not been heard from; and one, a boy 2½ years old, is still well, 20 months after the operation. The cord in so young a patient is so very small that the hernia might be cured for several years by almost any method.

My operation, with or without modification, was employed in 58 cases. Of the cases which healed per primam, not one has recurred. The wounds which suppurated were immediately laid wide open and allowed to heal by granulation. For the result in such cases the open method, and not mine, is responsible. There have been six recurrences—Nos. 2, 12, 24, 27, 39, 52. No. 2 took cathartics and got out of bed a few days after the operation. He was discharged for insubordination on the eighth day, before his wound was firm. In No. 12 the cord was not transplanted. In No. 24 a stitch abscess formed several weeks after his discharge. There is a slight impulse, on coughing, at the site of the abscess. In No. 27 the wound suppurated. The stitches were removed and the wound was laid wide open and allowed to heal by

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[1] I have performed three amputations within a year and a half through tissues which were almost surely infected and with instruments and hands which were as surely infected. No attempt was made to disinfect the wounds except that they were washed with a sterilized salt solution, and in one instance with warm water from the faucet. Great care was exercised in ligating and sewing and dressing to avoid constricting the tissues and to provide against tension. The wounds were closed as usual. They all healed absolutely by first intention.

granulation. This patient had a diffuse suppurative inflammation of the neck at the time of the operation. No. 39, the wound was opened for hemorrhage and allowed to heal by granulation. No. 53, the wound suppurated, was laid open, and healed by granulation. The patient has a flabby abdominal wall. The scar has stretched throughout its entire length, and there is an impulse all along the scar on coughing.

Statistics of Operations at the Johns Hopkins Hospital for the Radical Cure of Hernia.[1]

1. W. H. R., æt. 8. Large, right, congenital, inguino-scrotal, reducible hernia. Operation, 13, 6, 1889. Healed per primam. Last observation, 1, 6, 1891, the result is still perfect, 2 years after the operation.

2. G. H., æt. 20. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 17, 6, 1889. Healed per primam. Discharged for insubordination, 24, 6, 1889. Patient got out of bed several times and took cathartic pills without permission. 14, 6, 1892, there is a complete return of the hernia.

3. J. B., æt. 48. Very large, right, oblique, inguino-scrotal, reducible hernia. Operation, 16, 8, 1889. The bladder was caught in one of the stitches, and the wound, consequently, was laid open and allowed to heal by granulation. Last observation, 10, 3, 1892, the hernia has not returned, 2½ years after the operation.

4. M. E. L., æt. 14. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 19, 8, 1889. Last observation, 21, 3, 1892, the hernia has not returned, 2½ years after the operation.

5. J. D., æt. 8. Small, left, oblique, inguinal, reducible hernia. Operation, 9, 10, 1889. Healed per primam. Last observation, 5, 3, 1892, result still perfect, 2 years and 5 months after the operation.

6. C. I. B., æt. 38. Small, left, femoral, reducible hernia. Operation, 11, 10, 1889. Healed per primam. Discharged, 4, 11,1889.

7. F. F., æt. 7. Small, right, congenital, inguinal, reducible hernia. Operation, 12, 10, 1889. Healed per primam. Last observation, 25, 3, 1892, result still perfect, 2 years, 5 months after the operation.

8. J. W. F., æt. 12. Left, oblique, inguinal, reducible hernia. Operation, 21, 12, 1889. Healed per primam. Last observation, 30, 1, 1890, result still perfect. 1, 3, 1892, patient cannot be found.

9. S. McN., æt. 46. Large, right, femoral, strangulated hernia. Operation, 31, 12, 1890. Discharged, 2, 2, 1891. Result unknown.

10. L. L., æt. 27. Small, right, oblique, inguinal, reducible hernia. Operation, 14, 2, 1890. Open wound. 21, 3, 1892, the hernia has not returned.

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[1] A few cases have been added to this list since the reading of the paper.

11. H. S., æt. 37. Large, right, inguinal, reducible hernia. Operation, 21, 2, 1890. Healed per primam. Last observation, 1, 12, 1892, linear scar, result still perfect, nearly three years after the operation.

12. G. G., æt. 28. Large, left, oblique, inguino-scrotal, irreducible hernia. Operation, 2, 5, 1890. Cord not transplanted. Healed per primam. 14, 10, 1890, the hernia has recurred.

13. J. H., æt. 39. Small, left, direct, inguinal, reducible hernia. Operation, 20, 5, 1889. Healed per primam. Last observation, 21, 6, 1890, the hernia has not recurred.

14. E. H., æt. 35. Small, left, femoral, strangulated hernia. Operation, 17, 5, 1890. Discharged, 22, 6, 1890. Result unknown.

15. E. P., æt. 45. Small, right, oblique, inguinal, reducible hernia. Operation, 29, 5, 1890. Healed per primam. Last observation, 16, 6, 1890, the hernia has not recurred.

16. H. B., æt. 8. Small, right, inguinal, reducible hernia. McBurney's operation, 17, 7, 1890. Not heard from since discharged, 23, 8, 1890.

17. H. D., æt. 2½. Right, inguino-scrotal, congenital, reducible hernia. McBurney's operation, 17, 7, 1890. Last observation, 1, 3, 1892, the hernia has not recurred.

18. A. E., æt. 5. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 23, 7, 1890. 24, 11, 1890, the hernia has recurred.

19. G. W., æt. 45. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 23, 5, 1890. Not heard from since discharged, 8, 9, 1890.

20. K. F., æt. 11. Small, right, oblique, inguinal, reducible hernia. McBurney's operation, 4, 8, 1890. Last observation, 27, 3, 1892, the hernia has not recurred.

21. E. W., æt. 5. Small, left, oblique, inguinal, reducible hernia. McBurney's operation, 11, 8, 1890. 11, 11, 1890, the hernia has recurred. Patient wears truss.

22. D. H., æt. 9. Small, left, oblique, inguinal, reducible hernia. Operation, 23, 8, 1890. Healed per primam. Last observation, 23, 3, 1892, linear scar, result still perfect.

23. T. Y., æt. 52. Large, right, oblique, inguinal, irreducible hernia. Operation, 17, 9, 1890. The adhesions were too firm and too extensive to admit of the reduction of the hernia.

24. J. C. H., æt. 27. Large, left, oblique, inguinal, reducible hernia. Operation, 24, 9, 1890. Healed per primam. Last observation, 15, 11, 1892. A few weeks after the patient had left the hospital a small abscess formed about one of the stitches. Just at this spot there is a distinct impulse on coughing.

25. G. S., æt. 49. Large, left, oblique, inguino-scrotal, irreducible hernia. Operation, 27, 9, 1890. The operation was a difficult one and consumed two hours. Stitch abscess, 1, 3, 1892. Patient cannot be found.

26. C. M., æt. 4. Large, right, inguinal, congenital, reducible

hernia. Operation, 7, 10, 1890. Healed per primam. 1, 3, 1892, patient cannot be found.

27. M. C., æt. 20. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 26, 11, 1890. Healed per primam. The wound had been healed nearly three weeks when an abscess formed about the outermost stitch. This might be accounted for by the fact that the patient had at the time an acute purulent inflammation of the neck. Last observation, 5, 6, 1892, the hernia is beginning to recur.

28. W. McS., æt. 3. Large, right, oblique, inguinal, strangulated hernia. Operation, 10, 11, 1890. Healed per primam. Last observation, 25, 3, 1892, firm linear scar, result still perfect.

29. E. L. P., æt. 7. Small, right, oblique, inguinal, reducible hernia. Operation, 21, 11, 1890. Healed per primam, except for a small stitch abscess. Last observation, 20, 3, 1892, linear scar, perfect result.

30. A. M., æt. 15. Left, oblique, inguinal, reducible hernia. Operation, 24, 11, 1890. Healed per primam. Last observation, 28, 3, 1892, linear scar, perfect result.

31. S. P., æt. 30. Small, right, direct, inguinal, reducible hernia. Operation, 29, 1, 1891. Healed per primam. Last observation, 2, 4, 1892, linear scar, perfect result.

32. F. H., æt. 40. Small, right, oblique, inguinal, reducible hernia. Operation, 28, 1, 1890. Healed per primam. Last observation, 30, 3, 1891, linear scar, perfect result.

33. J. W., æt. 28. Small, right, oblique, inguinal, reducible hernia. Operation, 23, 1, 1891. Healed per primam. 1, 6, 1892, cannot be found.

34. F. S., æt. 27. Small, left, oblique, inguinal, reducible hernia. Operation, 6, 2, 1891. Healed per primam, except for minute stitch abscess. Last observation, 2, 3, 1891, linear scar.

35. J. L., æt. 14. Small, left, oblique, inguinal, reducible hernia. Operation, 20, 2, 1891. Wound suppurated. Last observation, 1, 3, 1892, hernia has not recurred.

36. J. T., æt. 47. Small, right, oblique, inguinal, reducible hernia. Operation, 24, 2, 1891. Healed per primam. Last observation, 15, 11, 1892, linear scar, perfect result.

37. P. J., æt. 6. Small, left, oblique, inguinal, reducible hernia. Operation, 17, 3, 1891. Healed per primam. Last observation, 14, 4, 1891, result still perfect.

38. E. K., æt. 27. Small, left, direct, inguinal, reducible hernia. Operation, 13, 3, 1891, open wound. Last observation, 21, 3, 1892, the hernia has not recurred.

39. E. J. C., æt. 23. Small, right, oblique, inguinal, irreducible hernia. Operation, 5, 6, 1891, the wound was opened completely for hemorrhage. Healed by granulation. 2, 4, 1892, the hernia has recurred.

40. M. P., æt. 35. Left, oblique, inguinal, reducible hernia. Operation, 8, 5, 1891. Stitch abscess. 1, 6, 1892, patient cannot be found.

41. F. S., æt. 14 months. Small, right, inguino-scrotal, congenital, reducible hernia. Operation, 19, 5, 1891. Healed per primam. 1, 6, 1892, patient cannot be found.

42. J. K., æt. 4. Right, oblique, inguino-scrotal, reducible hernia. Operation, 26, 6, 1891. Wound suppurated. Last observation, 5, 4, 1892, the hernia has not recurred.

43. F. D., æt. 49. Small, right, oblique, inguinal, reducible hernia. Operation, 26, 6, 1891. Stitch abscess. Last observation, 3, 4, 1892, the hernia has not recurred.

44. P. H., æt. 5. Left, oblique, inguinal, irreducible hernia. Operation, 11, 9, 1891. 2, 10, 1891, stitch abscess. 1, 3, 1892, patient cannot be found.

45. P. C., æt. 28. Small, right, direct, inguinal, reducible hernia. Operation, 16, 7, 1891. Wound healed per primam. 23, 3, 1892, patient cannot be found.

46. W. G. W., æt. 2½. Small, right, inguino-scrotal, congenital, reducible hernia. Operation, 25, 7, 1891. Wound healed per primam. Last observation, 1, 4, 1892, linear scar, perfect result.

47. G. B., æt. 22. Right, oblique, inguino-scrotal, reducible hernia. Operation, 4, 8, 1891. Wound healed per primam. Last observation, 1, 7, 1892, linear scar, perfect result.

48. A. McI., æt. 26. Right, oblique, inguino-scrotal, strangulated hernia. Operation, 8, 9, 1891. Wound suppurated. Last observation, 1, 3, 1892, the hernia has not recurred.

49. M. W., æt. 11. Right, inguino-scrotal, congenital, reducible hernia. Operation, 27, 8, 1891. Wound healed per primam. Last observation, 1, 11, 1891, the hernia has not recurred.

50. G. B., æt. 3. Small, right, oblique, inguinal, reducible hernia. Operation, 30, 9, 1891. Wound healed per primam. Ultimate result unknown.

51. J. W. B., æt. 5. Small, left, oblique, inguinal, reducible hernia. Operation, 9, 10, 1891. Stitch abscess. Last observation, 3, 3, 1892, the hernia has not recurred.

52. H. P., æt. 29. Small, right, oblique, inguinal, irreducible hernia. Operation, 9, 10, 1891. Wound suppurated. Healed by granulation. Last observation, 20, 3, 1892, the scar has stretched throughout its entire length. Truss advised.

53. E. L. B., æt. 28. Small, right, oblique, inguinal, reducible hernia. Operation, 3, 12, 1891. Wound healed per primam. Last observation, 7, 4, 1892, linear scar, perfect result.

54. A. M., æt. 4. Small, right, oblique, inguinal, strangulated hernia. Operation, 25, 11, 1891. Stitch abscess. Last observation, 6, 4, 1892, the hernia has not recurred.

55. H. B., æt. 21. Small, left, oblique, inguinal, reducible hernia. Operation, 10, 12, 1891. Stitch abscess. 1, 6, 1892, patient cannot be found.

56. H. R., æt. 20. Small, right, oblique, inguinal, irreducible hernia. Patient's hernia has been once unsuccessfully operated upon by another surgeon. Operation, 8, 1, 1892. Wound healed per primam. Last observation, 3, 1, 1893, linear scar, perfect result.

57. H. H., æt. 2. Small, right, oblique, inguinal, reducible hernia. Operation, 12, 2, 1892. Wound healed per primam. 1, 3, 1892, patient cannot be found.

58. A. F., æt. 30. Very large, left, oblique, inguino-scrotal, reducible hernia. Operation, 23, 2, 1892. Wound healed per primam. 1, 3, 1892, patient cannot be found.

59. K. H., æt. 30. Large, left, oblique, inguino-scrotal, reducible hernia. Operation, 4, 3, 1892. Wound healed per primam. A drop or two of pus about one stitch. 1, 3, 1893, patient cannot be found.

60. C. S., æt. 28. Small, right, oblique, inguinal, irreducible hernia. Operation, 11, 3, 1892. The wound healed per primam. 1, 6, 1892, patient cannot be found.

61. J. S. L., æt. 47. Large, left, oblique, inguino-scrotal, reducible hernia. Operation, 22, 4, 1892. Stitch abscess. 1, 3, 1892, patient cannot be found.

62. J. F., æt. 38. Very large, right, oblique, inguino-scrotal, strangulated hernia. Operation, 12, 5, 1892. The wound healed per primam. Patient had parotid abscess on both sides. Last observation, 22, 6, 1892, linear scar.

63. C. C., æt. 16. Small, left, oblique, inguinal, reducible hernia. Operation, 27, 5, 1892. The wound healed per primam. Last observation, 27, 6, 1892, linear scar.

64. M. W., æt. 45. Large, left, oblique, inguinal, strangulated hernia. Operation, 22, 5, 1892. Wound healed per primam. Last observation, 1, 9, 1892, linear scar, the hernia has not recurred.

65. T. M., æt. 33. Very large, direct, inguino-scrotal, traumatic, strangulated hernia. Operation, 24, 5, 1892. A gangrenous appendix vermiformis was excised. The wound suppurated. The patient was discharged, 2, 7, 1892, and cannot now be found.

66. T. McC., æt. 9. Small, left, oblique, inguinal, congenital, irreducible hernia. Operation, 27, 5, 1892. The wound healed per primam. Last observation, 23, 6, 1892, linear scar.

67. E. C., æt. 23. Right, oblique, inguinal, reducible hernia. Operation, 9, 6, 1892. The wound suppurated. Discharged, 4, 7, 1892.

68. J. McN., æt. 34. Large, right, oblique, inguino-scrotal, irreducible hernia. Operation, 10, 6, 1892. The wound healed per primam. Discharged for insolence, 25, 6, 1892. Last observation, 20, 2, 1893, linear scar, perfect result.

69. G. B., æt. 3. Small, left, oblique, inguinal, reducible hernia. Operation, 15, 6, 1892. The wound healed per primam except for a minute stitch abscess. Discharged, 7, 3, 1892.

70. J. N. W., æt. 21. Small, left, oblique, inguinal, reducible hernia. Operation, 16, 6, 1892. Wound healed per primam. Last observation, 1, 9, 1892, linear scar, perfect result.

71. C. S., æt. 58. Small, right, oblique, inguinal, irreducible hernia. Operation, 23, 6, 1892. The wound healed per primam. Discharged, 23, 7, 1892.

72. M. W., aet. 45. Small, right, oblique, inguinal, reducible hernia. Operation, 5, 7, 1892. The wound healed per primam. Last observation, 1, 9, 1892, linear scar.

73. H. R., æt. 25. Very large, right, oblique, inguino-scrotal, irreducible hernia. Operation, 9, 8, 1892. The wound healed per primam except for slight suppuration about one stitch. Discharged, 8, 9, 1892, well.

74. G. S., æt. 52. Small, left, oblique, inguinal, reducible hernia. Operation, 1, 9, 1892. The wound healed per primam. Discharged, 5, 10, 1892, well.

75. A. B., æt. 25. Left, oblique, inguinal, strangulated hernia. Operation, 6, 10, 1892. The wound healed per primam. Discharged, 1, 11, 1892.

76. W. K. H., æt. 43. Small, left, oblique, inguinal, reducible hernia. Operation, 29, 11, 1892. The wound healed per primam. Discharged, 27, 12, 1892.

77. C. C., æt. 22. Large, right, oblique, inguino-scrotal, reducible hernia. Operation, 13, 12, 1892. The wound healed per primam. Discharged, 18, 1, 1893.

78. A. E., æt. 5. Small, right, oblique, inguinal, reducible hernia. A recurrence after McBurney's operation in four months. Operation, 5, 12, 1890. The wound healed per primam. Last observation, 6, 4, 1892, the hernia has not recurred.

79. C. M. S., æt. 50. Large, right, femoral, strangulated hernia. Operation, 25, 12, 1892. Typical healing.

80. B. D., æt. 22. Large, left, oblique, inguinal, reducible hernia. Operation, 13, 1, 1893. Typical healing.

81. J. G., æt. 59. Very large, right, oblique, inguinal, reducible hernia. Operation, 10, 1, 1893. The wound healed per primam.

82. M. L., æt. 2. Large, right, oblique, inguinal, strangulated hernia. Operation, 29, 1, 1893. Typical healing.

The time has come when one may operate upon almost every case of hernia not only without danger to the patient, but also with an almost certain prospect of success. Those who with Bull have dropped the term "cure" may take it up again. That the mortality is practically nothing one may convince himself from the latest statistics.

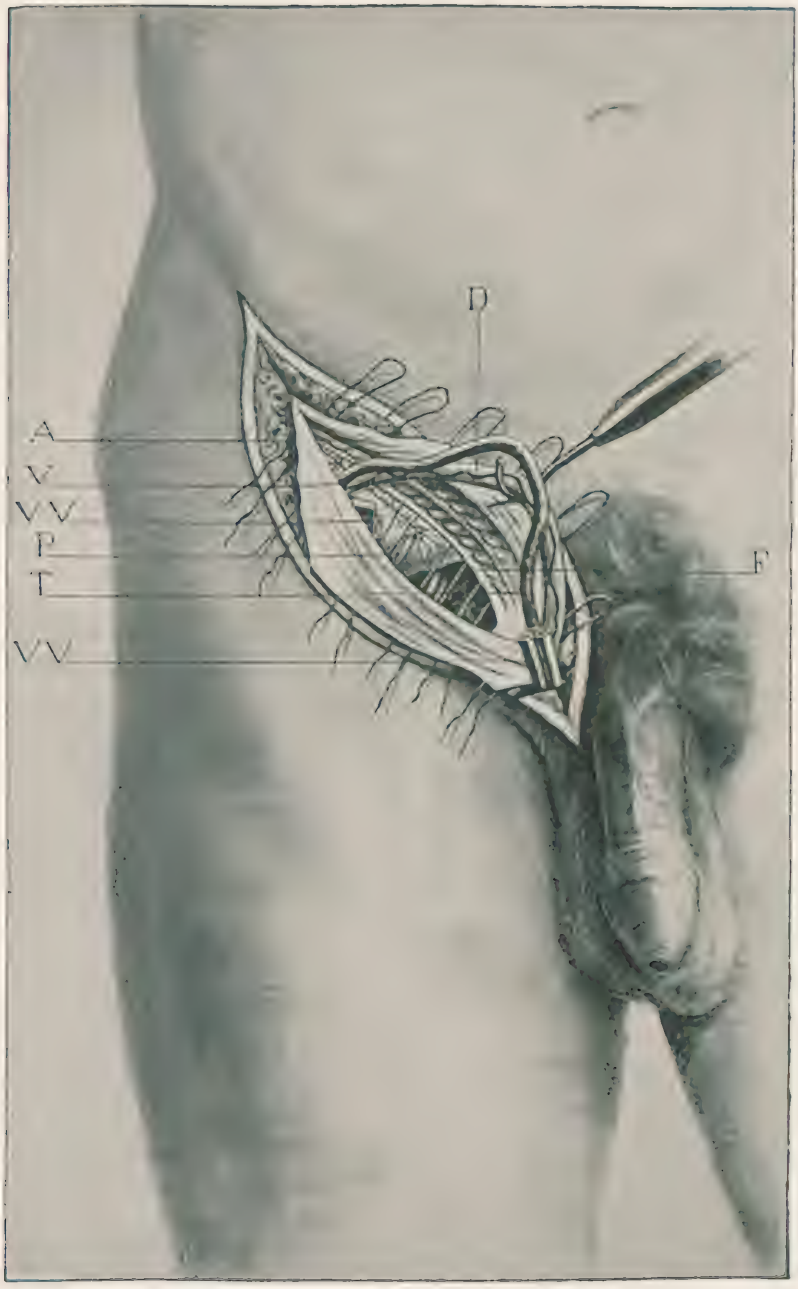
Svensson and Edman had from 106 cases one death from enteritis and nephritis on the tenth day when the wound was perfectly healed. McEwen operated 98 times for the cure of inguinal hernia, from 1879 to 1890. The only fatal case was that of a boy three years old who contracted scarlet fever after the operation and died within thirty-six hours. Bassini has operated 251 times for non-strangulated hernia by his method, with but one death, and this from pneumonia 15 days after the operation. The wound in the fatal case had healed per primam. Lucas-Championnière from 111 cases lost one from pneumonia. Kocher reports 119 operations for the radical

cure of hernia with one death. The cause of death was pulmonary embolism 15 days after the operation and when the wound was perfectly healed. We have operated 82 times for the radical cure of hernia without a death.

If it is objected that had it not been for the operation none of the deaths above enumerated would have occurred, we cannot positively deny it. But it is not improbable, as Kocher cleverly remarks, that if one should keep under observation hundreds of hernia cases of all ages and classes and present them every day with a good dinner, he would occasionally be able to announce a death among them. As to the ultimate results I shall refer only to those of McEwen, Bassini and myself. McEwen failed but once in 98 cases, and has had several cases under observation for ten years or longer. Bassini failed but seven times in 251 cases: one hundred and eight cases had been cured for from one to 4½ years, 33 from one year to six months, and 98 from six months to one month. In only four cases was the result unknown. It is now nearly four years that I have been operating for the cure of inguinal hernia in the manner just described by me, and thus far I have no failure to record, if we exclude the recurrences which I have reported and which could not be ascribed to my method.

Explanation of the Plates.

A, Aponeurosis of the external oblique muscle.
D, Vas deferens.
F, Fascia transversalis.
P, Peritoneum.
S, Buried skin-stitch, tied.
S', Buried skin-stitch, introduced but not tied.
T, Conjoined tendon.
V, Vein.
V, *V*, Stumps of excised veins.



To illustrate Dr. Halsted's article.

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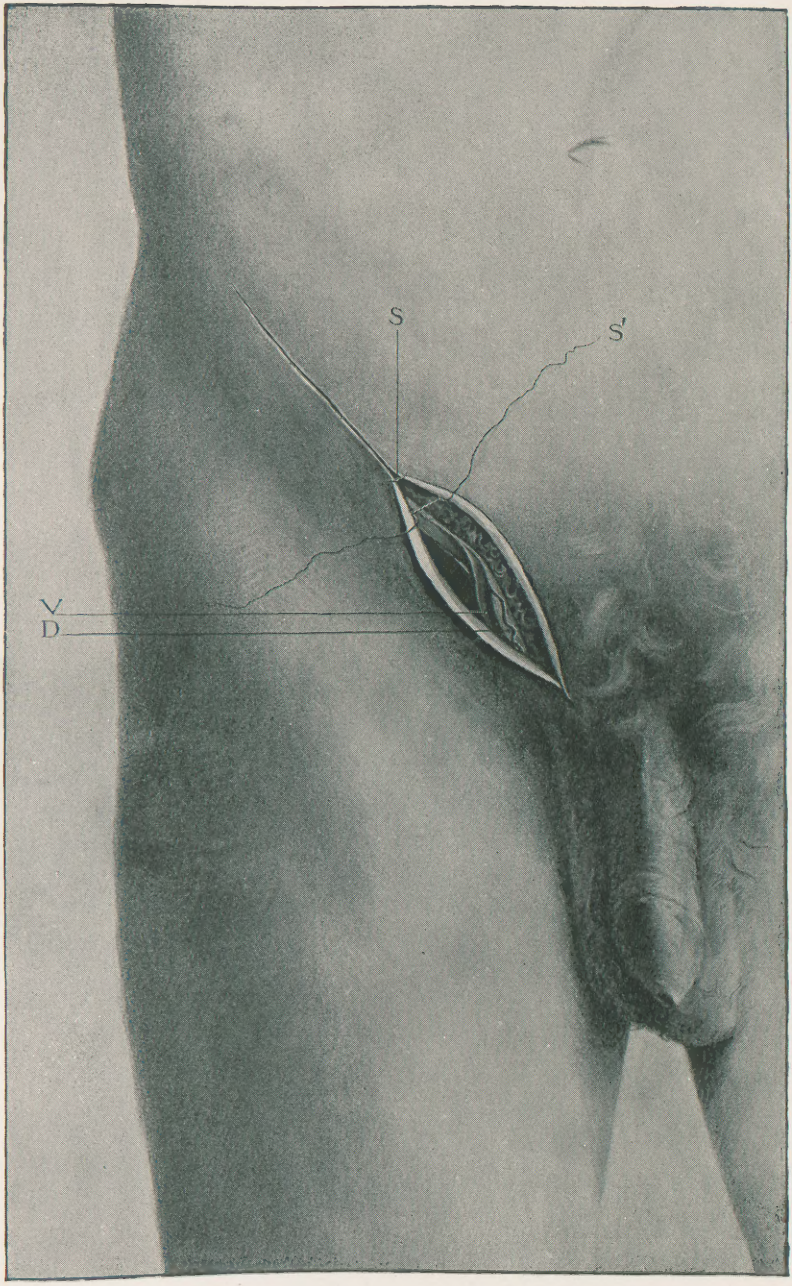

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